THE BIOLOGIST

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Interest in the Biological Sciences

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THE BIOLOGIST

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EMPLOYMENT FOR BIOLOGISTS

By Donald J. Zinn

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It is strange and sometimes disheartening to notice how often seniors who have successfully completed four years of college in bacteriology, botany or zoology confront their advisors several weeks before commencement with blank faces spattered by indecision, and with voices whose whining inquiry about positions indicate a lack both of initiative and interest in their own future. It is strange that students who have majored in the intensely absorbing field of biology should maintain so solid a disinterest in its nearly limitless opportunities, and disheartening that these very people can be probably counted on to perform as dilettantes if and when they eventually succeed in getting a job.

This is the hey-day of opportunity in the biological sciences, and there is little excuse for anyone concerned in the manifestations of living things not continuing his interest profitably after graduation. There are actually scores of vocations in biological work, and tens of thousands of people working in them. The basic biological training requires a major in one of the fields of biology in college followed by a year or more of special study sometimes supplemented by outside experience. This experience in the field may be obtained during the summer, very often for substantial remuneration.

Before listing the vocational opportunities in biology, it is perhaps pertinent first to summarize the qualifications needed for a biological career. In the words of the Institute for Research, "one who wishes to succeed in the biological sciences must have a legitimate curiosity — the curiosity of eternal youth, which is enthusiastically happy in every new fact and truth and explanation that is discovered — a love of learning for its own sake — a willingness to work long hours in the privacy of the laboratory, sometimes considered eccentric by his fellowmen, often misunderstood, often under suspicion by the average man — but finding joy in his work and in the knowledge that what he is doing is a part of the foundation upon which all generations must build."[1] Above all, the successful biologist must be thoroughly objective in his judgments, as accurate in language as in observation, and able to distinguish between pure science and the applications of science.

As in any other professional field, there are three ways to earn one's living in biology — teaching, practice, or research. The first of these, teaching, will not be considered here. Suffice it to say that there are at present a great many vacancies in biology, in all levels of education, and that fairly rigid rules govern entrance into the teaching profession. Here post-graduate work is practically mandatory, at least above the high school level. Information on the procedure to be followed if teaching biology is to be the chosen profession may be obtained from the proper local, state, federal or college authorities. If you plan to be a teacher, it is always wise to include courses in psychology, writing, and public speaking in your curriculum, and to investigate the requirements necessary for a teacher's certificate, if high school or junior college teaching is anticipated. At the present time there are over 25,000 men and women in this country earning their living teaching biology. An idea of the positions obtainable in this area above the high school level can be obtained from the columns of "Science," the "Bulletin of the American Association of University Professors," etc.

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[1] Several ideas in this paper are derived from "Biological Work As a Career." Inst. for Research, Chicago, Ill.

Listed below are some of the various specialties into which men and women trained in biology may enter. It should be noted that while some of these positions are of a practical nature, and require on the job training, most of them are dependent on basic work in the biological sciences together with either post graduate study and/or practical experience.

Majors in Bacteriology may specialize in the following:

1. *Pathogenic Bacteriology*, the study of disease producing bacteria.
2. *Dairy Bacteriology*, which concerns beneficial and injurious bacteria affecting dairy products.
3. *Soil Bacteriology*, of interest to those entering agriculture, forestry, etc.
4. *Public Health*, which involves water examination, sewage disposal, water filtration, and shellfish contamination.
5. *Bacteriological Chemistry*, having industrial affiliations in the study of fermentation.
6. *Immunity and Serum Therapy*, involving the research and manufacture of vaccines and serum.
7. *Medical Bacteriology*, a study of the various forms of disease-producing bacteria.
8. *Antiseptics and Disinfectants*, involving the control of parasitic and commensal organisms.
9. *Food Preservation*, concerning the control of bacteria harmful to stored foods.

Majors in Botany may specialize in the following:

10. *Agriculture*, a field of study in itself, but one which perhaps emphasizes botany more than zoology, soils, bacteriology, breeding, etc.
11. *Arboriculture*, involving the care, culture and landscaping of trees and shrubs.
12. *Dairy Husbandry*, which includes such subjects as Farm Dairying, Marketing Milk, Ice Cream Making, Dairy Judging, Dairy Standards and Tests, Dairy Production, Butter Making, Concentrated Milk Products, Cheese Making, Dairy Products, and Pasturage.
13. *Chemistry*. This concerns particularly Elementary and General Plant Chemistry, Elementary Textile Chemistry (wool, cotton and dyes), Food Analysis and Chemistry of Nutrition.
14. *Drug Manufacture*, Handling and Selling, which considers the Biological Pharmaceuticals from the Botanical and industrial viewpoints.
15. *Ecology*. This involves the zoologist as well as the botanist but is of primary importance in Game and Fish Culture, as well as for the Professional Conservationist and Farm Pond Manager.
16. *Forestry*. This subject includes such studies as Farm Forestry, Forest Mensuration, Silviculture, Forest Protection, Forest Physiology, Phytogeography, Forest Conservation, Wood Technology, Forest Products, and Municipal Forestry.
17. *Genetics*, a subject particularly useful to experiment station workers and others interested in the improvement of all types of plants—from food to ornamentals.
18. *Museum work*. This consists mainly of gathering, classifying, preserving and displaying plants or plant groups.
19. *Naturalist*. This is the type of work that requires love for the outdoors as well as possession of a keen observation.
20. *Nurseryman*. To be successful at this one must have a thorough and basic acquaintanceship with plant breeding and phytogenetics.
21. *Parasitologist*. Here is a vocation which can be applied to both medicine and agriculture. It is one that concerns a study of all the injurious organisms that affect plants and is particularly applicable to the plants of commerce of the tropics.
22. *Phytopathology*. This very useful

study can be well combined with No. 21 above, to procure a good paying job with nearly any commercial plant or seed establishment.

23. *Pharmacy and Pharmacology.* This is primarily concerned in drug manufacture and requires a more or less medical turn of mind.
24. *Poisonous Plants.* This is fairly well involved in No. 23, above, but may be considered from the point of view of public health or any similar category.
25. *Pomology,* the study of fruit culture. This is a particularly useful trade for one interested both in agriculture and forestry.
26. *Miscellaneous.* A student may specialize in any of the following subjects *after* his matriculation as an undergraduate majoring in botany or in agriculture: worker in wood products as turpentine, paper, rayon, cellulose, plastics; cereals; grasses; soy beans; cotton; tobacco; rice; fertilizers; stored and frozen foods; truck and greenhouse crops, etc.

Majors in Zoology may specialize in the following:

27. *Animal Husbandry.* This concerns many different phases of farming and marketing such as the livestock industry; livestock breeding, meat production; veterinary work, etc.
28. *Cultural and Physical Anthropology.* This is a study of the past and present environment of man as it has and continues to affect his cultural, social, physical, industrial, political and psychological well-being. It embraces among other things, an application of statistics to man's environment and is extremely useful to one interested in Sociology or in furniture designing.
29. *Apiarist.* This is a specialized calling involving the raising and maintenance of bee colonies and the honey industry.
30. *Biometrics,* involves the application of statistics to the growth of living individuals and populations, and to their environmental distribution. It is a tool which when once learned is nearly universally applicable in the field of biology.
31. *Dietetics,* concerns the analysis and evaluation of human foods. This is an important field for those interested in hospital work, diet formulae, and restaurant consultant. Embraces quite a bit of biochemistry.
32. *Ecology.* This is similar to the type of material considered under number 15, and is necessary for numbers 37, 38, 41. From a zoological viewpoint, ecology is a study of animals in relation to their environment.
33. *Animal Farming.* This is a field for those interested in commercial fur farms and for those who eventually wish to become pet-shop owners or kennel proprietors.
34. *Entomology.* This field has many outlets, a few of which are suggested here.
    a. Medical Entomology: Insects as they affect the health of Man and animals. This is a tremendous field with many openings at the present time.
    b. Agricultural Entomology: Insects that are beneficial or injurious to both crops and domestic wild life.
    c. Culture of the Silk-worm, Lac Insects, Parasites and Predators of Insect Pests. Commercial applications and specialization in entomology. See number 29 for additional information.
    d. Museum entomology: Specialized work for specialists in pure entomology. Requires quite a bit of post-graduate work and experience, but is most rewarding to the taxonomist.
    e. Pest control: This deals primarily with household and building pests.
35. *Ethnology.* This is closely associated with anthropology and is confined mainly to race histories. In this country it concerns the aborigines of Central America, the United States, Canada and Alaska. A sub-division of this subject, Ethnobiology, has recently come in for considerable investigation in our Southwestern Basin and Range country.
36. *Eugenics.* Here is embraced a study of the betterment of the hu-

man race. One must have a good grasp of human genetics, ecology of populations, human population distribution, anthropology, and statistics.

37. *Limnology.* This is a subject which has lately come into its own, and in which there are many openings at the present time. It concerns the ecology of fresh-water life, and embraces biology; elementary geology, chemistry and physics; and statistics. Positions are to be had with both state and private agencies, fish hatcheries, farm pond management advisors, conservation groups, etc.
38. *Oceanography.* This embraces the same type of work as No. 37, but as applied to salt water. There are a tremendous number of well paid positions open at the present time in this area for adequately trained personnel. Oceanography is considered at greater length further on in this paper.
39. *Hygiene.* This is a field for social service and community workers, as well as those interested in entering the Federal Pure Food and Drug Administration. Its scope is not confined merely to personal body care but embraces many different subjects, among which are the following: Food Hygiene; Dairy Hygiene; Industrial Hygiene (involving fair labor practices, etc.); and Sanitary Engineering. In the last mentioned subject, one must concentrate as much in engineering as in biology.
40. *Laboratory Technician.* At the present time, this is a wide open field with remunerative positions and one which can absorb as many adequately trained personnel as can apply for jobs. There are only a few colleges in the country offering a four-year option in this field. Advised courses are in anatomy, embryology, bacteriology, pathology, parasitology, X-ray technology, histological technique, public health, immunology, etc. In some instances it may pay to take a year's post-graduate training in an accredited hospital and become a Registered Medical Technologist.
41. *Ichthyology.* In itself, this is a tool no more useful than herpetology, ornithology, or kindred subjects. Excellent for those interested in museum work or in topics Nos. 32, 37, and 38. If pet-shop or nature study is to be one's life work, concentration in these fields is strongly recommended.
42. *Meat Inspection.* A study of this subject involves a knowledge of both the histology and parasitology of the animals inspected. This is a useful field for those working with commercial meatpackers and those who wish to enter the pure food and drug administration.
43. *Medical Zoology.* This is not to be confused with pre-medical training, but is a field which concerns the influence, fair or foul, of other animals on man. It can be sub-divided as follows:
    a. Tropical medical zoology considers the large fauna directly affecting man inhabiting the tropics.
    b. Protozoology in this connection involves the parasitic and commensal acellular animals affecting man (see No. 32).
    c. Helminthology deals in this case with the parasitic worms of man and domestic animals (see Nos. 32 and 44).
    d. Entomology concerns here the study of insects as vectors of disease (see No. 32).
44. *Parasitology.* Here is a very broad field involving the largest animal phyla as parasites, and all of the phyla as hosts. To master this subject *in toto*, is practically an impossibility. It is therefore wise to determine whether one is going into protozological, veterinary, conservational, entomological, helminthological, or agricultural parasitology, and to adjust one's course accordingly. (See Nos. 32, 34, and 43.)
45. *Pharmacology.* This is a study of the physiological actions of the various drugs and chemicals on living plants and animals. Livelihood in this field is to be gained in commercial drug factories and laboratories as well as in private experimental laboratories.
46. *Taxidermy.* This once-popular study of the museum preparation (stuffing and mounting) of ani-

mals for public demonstration is in tremendous demand at present since there are very few adequately trained personnel. It is a comparatively easy profession to follow, and can be developed readily from hobby status.

47. *Toxicology.* This is actually a subdivision of No. 45. This study of the actions of poisonous drugs and chemicals on animal tissues has been made prominent by crime detection, and by the Federal Trade Commission. Jobs are available at nearly any progressive food or drug manufacturer or processor.
48. *Veterinary Medicine.* This is a rather discouraging field since there are only about 30 first rate veterinary schools in the country. The demand for veterinarians is very great in some sections of the country. The living to be made from this profession is generally excellent. Competition is cut-throat for entrance to veterinary college. A state board examination is required in most states before one can practice.

Listed below are some of the non-teaching positions in biology. The salary in most cases varies from $1800 to $6500. In several instances, top-ranking positions will draw nearly $10,000. Note that for permanent federal positions, civil service examinations and physical examinations have to be taken and that in some instances previous experience counts half of one's rating. Information concerning the necessary preparation and requirements for these jobs can be obtained directly from the head of the department involved, or the Civil Service Commission at Washington, D. C.

In the case of State departments, the type of work depends to a great extent on the needs of the department and its geographical location. The general plan in most States is the same; you should realize, however, that States in mining country will specialize in that field; States in agricultural country will have a large agriculture department, etc. As a rule, the salary scale is not as high in the State departments as it is in the federal departments; but compensation for their difference is made up in other ways. Many States require state board examinations to enter the state civil service.

Where larger cities are concerned, employment is made of directors of health education; food and sanitary inspectors; medical; dental, laboratory, and veterinary technicians; veterinarians; quarantine officers; bacteriologists; bio-chemists; foresters; etc. The salaries of these employees varies greatly in time of employment and in geographical location. It should be realized that in many cases, city positions, especially in the higher brackets are political appointments.

A. Federal Departments
  1. Department of Agriculture
    a. Bureau of Animal Industry
    b. Bureau of Plant Industry, Soils, and Agricultural Engineering
    c. Soil Conservation Service
    d. Bureau of Agricultural and Industrial Chemistry
    e. Bureau of Dairy Industry
    f. Bureau of Entomology and Plant Quarantine
    g. Bureau of Home Economics and Human Nutrition
    h. Agricultural Research Center
    i. Office of Experimental Stations
    j. Forest Service
  2. Federal Security Agency (Commissions and Civil Service)
    a. Public Health Service
    b. Pure Food and Drug Administration
  3. Department of the Interior
    a. Fish and Wildlife Service
    b. National Park Service
    c. Geological Survey
    d. Office of Indian Affairs
    e. Alaska School and Reindeer Service
  4. Department of the Navy (Commissions and Civil Service)
    a. Division of Oceanography
  5. Department of the Army (Commissions and Civil Service)

B. State Departments (organizations differ considerably among States)
  1. Department of Agriculture
    a. Division of Markets
    b. Division of Feed and Fertilizers
    c. Division of Poultry and Egg Marketing
    d. Division of Entomology
    e. Division of Seed and Weed Control, etc.

2. Department of Veterinary Science and Inspection
3. Department of Fish and Game
4. Department of Conservation
    a. Division of Biological Surveys
5. Department of Public Health
    a. Bureau of Vital Statistics
    b. Bureau of Contagious Diseases
    c. Bureau of Embalming
    d. Bureau of Child Welfare and Public Health Nursing
    e. State and Branch Laboratories of Hygiene
    f. Cosmetic Art Department
    g. Antitoxin Department
    h. Pasteur Treatment Department

C. City Departments
    1. Park Commission
    2. Health Department
    3. Water Department
    4. Sewage Disposal Plant

There have been listed below, some various types of what have been called "non-public" types of biological work. It is in this area that biological training plus business acumen plus ingenuity can be made to pay large dividends. Two examples of great financial gain due almost entirely to previous biological training are Alexander Agassiz in mining, and Joseph Cushman in oil.

1. *Biological Artists, Model Makers and Map Makers.* Employment is found in museums, private laboratories, medical and dental schools, and particularly in biological supply houses. It is pointed out that good biological and medical artists are at a premium and that talent in this field is always in demand.
2. *Biological Supply Houses.* These establishments offer positions to technicians, taxidermists, collectors, salesmen, artists, etc. The work normally is not too technical, and the pay is fairly good. This position is unique in the biological world since regular working hours are normally observed!
3. *Biological Journals and Reporters of Natural History for Newspapers and Magazines.* It is especially urgent that editors, writers, and assistants who have a background in general biology and who have kept up with recent advances in the biological sciences, and who have both an ability and interest in writing enter this field. It is all too evident today that much of the reporting in our dailies and weeklies of matters biological is crude and inaccurate. Such distortion for the sake of popularization does no credit to our profession or its practitioners.
4. *Botanical Gardens, Zoological Parks, City Parks and Playgrounds, Private and Public Nurseries, Private Estates, Florists, Town Forests, etc.* Work at any of these establishments varies considerably, and remuneration depends a great deal on the type of position and the background of the organization in which one is employed. Jobs in these places are secured by direct application.
5. *Collectors.* This is a business with many outlets. For one interested in establishing by himself, many opportunities are presented: plants for florists and drug houses; animals for supply houses, museums, private collections, pet shops, etc.
6. *Experimental Laboratories.* These vary from agricultural and animal husbandry experimental stations to the cancer research laboratory, such as the privately endowed Roscoe B. Jackson Memorial Laboratory in Maine. There are many opportunities in these establishments for a variety of specialists in the field of biology.
7. *Hospital Technicians.* There are roughly 7300 hospital laboratories fairly evenly distributed throughout the United States which hire more than 12,000 part-time or full-time assistants. These assistants should be proficient as general laboratory technicians rather than specialists in a single technique.
8. *Industrial Concerns.* A few of the many industrial fields requiring biologically trained workers is grouped below. Opportunities for advancement are good for the hard worker. The biologist is hired to make money for the concern, and he must be an asset to the concern. The salary ranges, of course, vary greatly; incomes climb from a modest living to those of high priced specialists and executive officials. The positions in this field are in the manufacturing of drugs, insecti-

cides, cosmetics, flour, foods of all kinds, oils, vinegars, soaps, yeasts, beverages, etc.

9. *Stenographers and Clerks.* There is always a great demand in college biology departments; in medical, dental, agricultural, and veterinary offices, private, public, and college; and in private research institutions, for typists and clerks who are not only conversant with biological terminology and nomenclature, but who can be counted on to handle positions of varying responsibility.

One major field of biology that has been extensively developed during the war is oceanography. Since demand continues to increase for workers in the field, since remuneration is above average, and since it should interest not only majors in zoology, but also students in botany, biochemistry, biophysics, statistics and geology, a brief description of the opportunities in oceanography is included.

In addition to the various private and federal laboratories on the Atlantic Coast, many of which are actually in dire need of trained technicians and research assistants is the even more pressing demand for those people on the West Coast. To give one of many examples, there is the Scripp's Institution's (La Jolla, California) program on the biology of the pelagic fish populations along the Pacific Coast. This is a cooperative program established on a permanent basis with the fishing industry, and one which will provide a working budget of something over $400,000 a year.

There is a second large program which has just been instituted by the Fish and Wildlife Service in Hawaii and the former Japanese Mandated Areas. This is a new field made possible by the Farrington Bill which provided for the exploration, investigation, development and maintenance of the fishing resources of territories and island possessions of the United States in tropical and sub-tropical Pacific Waters. It provides for the establishment of a central experiment station in Hawaii, sub-stations at the discretion of the Fish and Wildlife Service, one high-seas Oceanographical research vessel and two experimental high-seas fishing vessels. Only two staff members have been selected thus far for this project.

Another Federal Fisheries program has been instituted in the Philippine area with a $1,000,000 yearly allotment by the State Department for the rehabilitation of Philippine fisheries. This project has been underway for a year and at the present time, two vessels are engaged in preliminary investigations under the direction of Leonard Warfel, who was at one time with Dr. Daniel Merriman in New Haven. A permanent research laboratory and field program will be established somewhere in the Philippines following a five-year period of investigations. A skeleton staff, largely of inexperienced men, was finally rounded up and sent into the field, but a considerable number of better-trained investigators will be required when the program is established on a permanent basis. The Navy Island Government Division administers all of the islands in the former Japanese Mandated areas, between Okinawa and the Gilberts, with the exception of the Philippines. Scientific staffs in various fields including those aspects of biology applicable in the exploitation of marine resources, remain to be established. It is possible that Island Government administration may be eventually transferred from the Navy to the Interior Department, but no matter who eventually assumes responsibility for the administration of these areas, scientific personnel will be required.

The present Pacific Oceanic Biology Project completed its preliminary phase last September (1948). In the meantime a field program for continued investigations on a permanent basis is being formulated. The exact size of the scientific staff cannot as yet be predicted, but it will be sufficient to fulfill a middle position in a three-way program covering all phases of oceanography. On the one hand it will be correlated with the physical oceanographic work of the Hydrographic Office and on the other with the Fisheries Biology program, which has just been described.

In addition to these major organizational developments it is safe to say that there will be an increasing number of positions in individual coastal institutions. The University of Miami

Marine Station, for example, has recently added several new members, and the University of Washington Marine Station will no doubt add biologists during the next few years. This Laboratory was closed and the entire staff disbursed during the war. Few biologists have as yet been recruited as replacements.

It can be seen that the opportunities for men trained in the fundamentals of population biology (required for all of these positions) are almost unlimited and competition for some years to come will be almost negligible because none of the zoology graduates from institutions not concerned with population biology can qualify, except in the case of Federal Civil Service (Fishery) Positions for which recent examinations have merely been aptitude tests. The regional Fishery directors, however, need only accept, from the approved lists, those who in their estimation have the necessary qualifications. Recent northeastern seaboard additions to the U. S. Fish and Wildlife Service have been either limnologists from Cornell University or Rhode Island State College trained men. At present, there are two from each institution.

It is evident that none of the major Pacific projects can be adequately carried out until new personnel have been trained. To accomplish this, Scripps has introduced courses in physical oceanography; the Fish and Wildlife Service is planning to develop at Woods Hole, Mass., a center for indoctrinating new men in fisheries biology, and an educational training program for oceanic biologists is being recommended as essential to the carrying out of our investigations in the Pacific.

Post-graduate training in this field can certainly be obtained at Scripps Oceanographic Institution, La Jolla, California; University of Washington, Seattle; Cornell University, Ithaca, New York; Yale University, New Haven, Conn.; Rhode Island State College, Kingston, R. I.; The Marine Biological Laboratory, and the Woods Hole Oceanographic Institution, Woods Hole, Mass.; the University of Maimi, Miami, Fla.; and William and Mary College, Williamsburg, Virginia.

In closing this brief outline, it might be well to point out that there exists at the present time, whether fairly or not, a prejudice in some fields against the further training or employment of "disappointed" pre-medical students. These are the men and women who have failed for some reason to get into medical school. In many cases this is not their fault, but more often it is a situation, which if faced objectively at a sufficiently early stage in the individual's career might have been avoided. The competition in the medical field is keen, and from a practical viewpoint, wishful thinking regarding future success is out of place. In this instance, it is truly said that, "pride goeth before a fall!"

Finally, there are three points that should be presented to all persons entering the field of Biology:

1. Even in times of depression, there is a position for the outstanding biologist.
2. Those whose chief aim in life is just the possession of a large bank account should stay out of this field entirely.
3. Most positions are obtained by means of contacts, usually between the individual under whom you have studied and the employer. If you are good, he merely states to the employer, "You can't go wrong hiring this man." If your work has been mediocre, he cannot recommend you. In this instance you will find it more difficult to land a position—especially on your own. The employer invariably asks your advisor's opinion.

Listed below are some of the general references for information about positions in biology, most of which can be obtained free on request.

1. Preview of Opportunities for Experts in the Medical Service Corps. Chief, Procurement Branch, Personnel Division, Office of the Surgeon General, Department of the Army, Room 2 E 526, The Pentagon, Washington 25, D. C.
2. A Survey of Academic Qualifications for Fishery Biologists and of Institutional Facilities for Training Fishery Biologists by H. J. Deason. Fishery Leaflet 101, U. S. Department of the Interior, Washington, D. C., 1941.

3. Should I Be a Wildlifer? by John H. Lewis. Wildlife News, pp. 2-3, Autumn, 1947.
4. Biological Work As a Career. The Institute for Research, 537 South Dearborn St., Chicago, Illinois. 16 pp.
5. The Outlook for Women in Occupations Related to Science. U. S. Department of Labor, Women's Bureau. Bulletin No. 223-8, 1947 (has excellent bibliography).
6. Study Abroad. International handbook. Fellowships, scholarships, educational exchange. I: 1-225, 1948. (Columbia Univ. Press, New York 27, New York for UNESCO).

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New Grading System

Princeton University has introduced a new academic program which measures student effort on the basis of over-all ability, thus disregarding deficiences in minor subjects.

Under the program, which is expected to have far-reaching influence among other schools, the university has discarded the traditional college practice of requiring a specific number of course credits for a degree. It has also drastically revised present standards of "passing" and "failure."

Henceforth, Dr. Jeremiah S. Finch said, a student who fails a subject will not have to repeat that course or an equivalent course. His over-all performance instead of individual course grades will be the criterion for determining whether a student should be allowed to continue college.

"A student who has several failures, but who nevertheless has an average which meets the university's requirements, will be allowed to continue college," Dr. Finch asserted. "We are emphasizing a qualitative rather than a quantitative concept of education."

Many professional schools, including most of the medical colleges, long ago adopted this view, he said. Until now, Dr. Finch continued, a student had to pass a certain number of required courses to receive a degree. "We believe that the 'pass-fail' system is not educationally valid," he commented.

At Princeton the faculty committee has established a system of "sliding averages." A freshman who, perhaps because of the newness of college work, failed several subjects, would be permitted a lower general average than would sophomores, juniors or seniors. With each succeeding year, however, his work would be reviewed and the requirements for a passing average scaled higher.

Actually, Dr. Finch said, the new program does not make it any easier for students to get their degrees, even though in some instances a student may now earn a degree with far less credits than before. Most students who failed under the old system, he explained, would also fail under the new program.

It does, however, make college life a little easier for students, particularly for the "borderline cases." Under the traditional system, these students, the least able, were forced to carry an extra burden of "make-up" courses to replace the subjects in which they had failed.—Leonard Buder, in *New York Times*.

Independent Colleges

No one planned a free enterprise system for America. Free enterprise economics is the natural consequence of free men trying to make a living in a free society; while the privately financed, independent liberal arts college is the finest example in the history of mankind of free men, unhampered, seeking truth.

Privately financed colleges cannot exist in a society which fails to support private enterprise and I am personally of the opinion that private enterprise will not long survive in America if our privately financed colleges disappear.

This is a matter on which I feel very deeply. I have given nineteen years of my life and much of my fortune in support of it and I am ready to give the rest of my life and what remains of my money to any effort that will bring business and education closer together in the common cause of freedom.—President Frank H. Sparks, Wabash College, before the Indiana Society of Chicago.

NO MORE CULTIVATION WITH 2,4-D?

By Francis B. Muller

Rhode Island State College, Kingston, R. I.

For a while, it seemed that 2,4-dichloro-phenoxy-acetic acid had the weeds under control. Cultivators and weeders and other weed control implements were obsolete — as far as corn was concerned, anyway. Results like those obtained in Kentucky during the 1947 season when a $2,000,000 corn crop was saved by 2,4-D (1), and by Anderson and Wolf (2) at the New Jersey Experiment Station seemed to bear this out. However, some conservatives, especially farmers, maintained that cultivation stirred and aerated the soil, increasing yields that way, besides controlling weeds. This past year seemed to bear them out.

An experiment was conducted at Kingston, Rhode Island in 1948 to determine the effect of time and rate of application of 2,4-D on corn. Four rates of application of 2,4-D were made: ½ lb., 1 lb., 1½ lb., and 2 lbs. acid equivalent per acre*. These amounts were applied at pre-emergence, at emergence, when the corn plants were about two inches high, and when the plants were about a foot high. This last spray was made on a set of plots previously treated at pre-emergence, so that double the amount of 2,4-D was actually used.

Part of each treatment was not cultivated at all, but left to the weeds. The remainder of each treatment was giving two cultivations. Ohio K-24 was the hybrid used and it was fertilized with 1000 lbs. 4-12-8 fertilizer. The corn was planted May 19 and harvested October 7. Grain yields were taken and converted to bushels per acre shelled, 14% moisture. The yields for the various times and rates of application for the two different cultural treatments follow:

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*The butyl ester of 2,4-D was used, diluted with 5 gallons water per acre.

Table I — Treated and not cultivated.

		Amount of 2,4-D acid equivalent per acre.				
Time of application	*None*	*½ lb.*	*1 lb.*	*1½ lb.*	*2 lbs.*	*Aver.*
Pre-emergence	8.2	9.4	10.0	24.2	29.4	16.2
Emergence	8.7	20.6	19.4	31.8	32.8	22.7
2″ High	19.4	13.4	16.0	15.3	15.9	16.0
PreE. & 12″ High	13.8	15.0	21.8	25.0	25.9	20.3
Average	12.5	14.6	16.8	24.1	26.0	

Least Significant Differences: Between Times—3.3 Bu. Between Rates—6.1 Bu.

Table II — Treated and two cultivations.

		Amount of 2,4-D acid equivalent per acre.				
Time of application	*None*	*½ lb.*	*1 lb.*	*1½ lb.*	*2 lbs.*	*Aver.*
Pre-emergence	35.1	39.5	45.1	45.9	64.4	46.0
Emergence	38.7	56.9	52.4	56.2	37.3	48.3
2″ High	42.9	31.7	31.5	24.8	39.4	34.1
P.E. & 12″ High	40.3	48.2	43.9	59.7	32.7	45.0
Average	39.2	44.1	43.2	46.6	43.4	

Least Significant Differences: Between Times—6.4 Bu. Between Rates—11.4 Bu.

The striking thing in Table I is the low yields, though the yields in Table II are also considerably below the average for Ohio K-24. This hybrid yielded 58.8 bushels per acre in the grain corn variety trials under regulation cultivation. Discounting the 2 inches high application, which definitely injured the corn, the yields are still considerably less than half the 58.8 bushels when not cultivated. Even with two cultivations, the yields fall below this amount, with the exception of two treatments.

What was the cause of such low yields? Fairly good weed control was obtained at pre-emergence and at emergence with the 1½ lb. and 2 lbs. treatment with 2,4-D. Even quackgrass (*Agropyron repens*) and nutgrass (*Cyperus* spp) were inhibited to some extent early in the season, and the broadleaved weeds were completely eliminated for over a month. However, the plots upon which this experiment was run contained mostly quackgrass and nutgrass, and after the affect of the 2,4-D had worn off, took possession of the plots. The 12 inches high spray, applied in mid-July, had no effect upon these plants. So one reason for the low yields was the type of weed present.

A look at the weather for the 1948 season gives a few more reasons for the low yields.

Table III. Weather data for the 1948 growing season, by month.

Month	*Mean Temperature*	*Normal*	*Departure*	*Rainfall*	*Normal*	*Departure*
April	47.0	44.5	+2.5	4.20	4.63	—0.43
May	53.4	55.0	—1.6	8.61	3.86	+4.75
June	62.8	63.6	—0.8	2.37	3.46	—1.09
July	69.8	69.2	+0.6	1.87	3.34	—1.47
August	69.4	68.0	+1.4	0.79	4.30	—3.51
September	61.6	61.8	—0.2	0.96	3.90	—2.94
October	50.8	51.5	—0.7	4.22	4.05	+0.17

The excessive rainfall and cold weather in May and early June delayed the emergence of the corn for about five days, and held the plants back for several weeks thereafter. The weeds, on the other hand, made better progress after recovering from the spray, and offered serious competition when the dry weather set in in August.

Furthermore, the heavy spring rains compacted the soil to a great extent, preventing proper root development and aeration of the soil. This condition was aggravated by the mid-summer drought which baked the soil into something resembling brick. Even the two cultivations on the treated plots were made too late to repair the damage of the May rains. Sylvester (6) in Connecticut reported that lowered yields were caused more by soil compaction than by weed competition, as their 2,4-D treated plots were practically weed-free, throughout most of the season. So cultivation in itself, and not to keep the weeds under control, increased yields, and seems to be necessary under certain conditions.

Finally, the weather conditions at time of application and just after have a considerable affect on the action of 2,4-D. Mitchell and Brown (4) have shown that for optimum inhibition or kill, the plants should be in active state of growth. Swanson (5) in Iowa reported poor results with 2,4-D during the 1948 season as a result of dry soil conditions at time of application. As a consequence, the weeds were not in an active stage of growth and therefore somewhat more resistant to the 2,4-D.

At Kingston, the poor weed control with the grasses and broadleaved plants at the ½ lb. and 1 lb. applications was due to excessive soil moisture and cold and cloudy weather. Temperature and rainfall greatly influence the amount and rate of kill, as is shown by the work of Marth and Davis (3) and Weaver, Minarik, and Boyd (7). Low temperatures, cloudy weather, and a saturated soil all add up to a slowing up of plant growth, and therefore more resistant weeds.

So it seems that 2,4-D by itself is not the complete answer to weed control under all conditions. Types of weeds, weather conditions at time of and subsequent to application, and soil conditions must all be taken into account.

A combination of chemical weed control and cultivation may be the answer, the number of cultivations necessary being dependent upon the above-mentioned conditions.

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A University Is a Dedicated Community

The place for the hard intellectual work which must be done if democracy is to be instituted and is to endure is the universities. A university is a place where people think. The motto of a university should be the sentence of Descartes: "I think, therefore I am."

A university must stand for something, it must stand for the civilization of the dialogue. It must stand for the Rights of Man. It must stand for the highest powers and the highest aspirations of man. A university is a microcosm. Its aim is not to mirror the macrocosm, but to show what the macrocosm might be.

A university is therefore a dedicated community. In one sense, its task is always the same. Its task is always to think, to think as coherently and as profoundly as possible about the nature of the world and the destiny of man. Partly because of its concern with the education of the young, partly because of its concern with fundamental problems, a university looks toward the future.

But what if there is not future? The sorcerer's apprentice now struggles desperately with the forces which he has himself released. His science, his technology, his weapons, and his machines have turned upon him. History is looked upon as the struggle for power. If that conception is correct, history is about to close, for the struggle for power now leads fatally to war, which can have no end except annihilation.

When there is no future, the universities have to make one. Learned men have in the past made a future by going into remote fastnesses and keeping the lamp of learning alight. Now there is no hiding place. We have to stop war. We have to put an end to nationalism. We have to get rid of the great fear in the world.

The democratic world is a work, and it is first of all an intellectual work.

The questions before us are of this order: whether there is some way in which modern man will be able to live without becoming daily less and less human; whether it is possible to organize economic life so that the needs of the community take precedence over the profit of individuals; whether it is possible to accommodate the legitimate demands of the society and the imprescriptible rights of the human person; where it is possible to integrate the currents of contemporary ideas and modern scientific knowledge in a more ordered vision of the world and arrive at a synthesis which, while preserving variety and difference, lays the foundation for understanding, communication, community, and the continuity of the great conversation. These are intellectual questions.

They are not German questions or American questions; they are world questions. The world is now one.—From address by Chancellor Robert M. Hutchins, University of Chicago, in Frankfurt, Germany.

A NEW PENNSYLVANIAN VARIETY OF CONULARIA CRUSTULA FROM THE SEMINOLE FORMATION OF THE BASAL MISSOURI SERIES

By Edward Richard Ries

TAXONOMY

The conularids have one of the most disputed systematic positions of all fossils. Since the genus was first described by Miller in 1818 they have been assigned to various biological groups. In 1872, Nicholson[1] placed the genus Conularia in the Class Pteropoda of the Phylum Mollusca. This classification was retained by Miller[2] in 1877 and Weller[12] in 1898. In a later work, Walcott established the family Conularidae and Miller and Gurley realizing the problematic nature of the conularids, established the Class Conularida under the Phylum Mollusca. This classification was retained by Grabau and Shimer[15] in 1910. They suggest that the relationship to the pteropods is distant, and that it is probably of a parallel rather than a genetically related group. In 1915 Girty[16] placed the Class Conularida into the Phylum Annelida. Zittel[19], in 1927, divided the conularids and placed them into the Suborder Conulariida of the Order Opisthobranchia in the Class Gastropoda. In their work in 1935, Shimer[23] as well as Twenhofel and Shrock[24] retained the conularids in the Class Gastropoda. In 1937, however, Kiderlen[25] assembled convincing observations to support his conclusions that Conularia and closely related genera are anicent Scyphozoa of the Phylum Coelenterata. This view is also shared by J. B. Knight. Shimer and Shrock[26] (1944) have retained the conularids in the Class Scyphozoa. At present over one hundred species of conularids which range from the Ordovician to the Jurassic have been described

CONULARIA CRUSTULA VAR MAGNUS N. VAR.

A number of specimens from the Seminole formation in the basal Missouri Series of the Pennsylvanian agree in general with *Conularia crustula* White, but differ from it in being extremely large. Many specimens are two to three times as large as the typical specimen of *Conularia crustula* which have a mean average length of about 31 mm. The only other common species in the Pennsylvanian is C. roeperi which is somewhat larger and has a much larger apical angle. The striae of this variety is more distant and they are sigmoidally curved instead of being nearly straight.

The general shape of the shell is regularly conical, the sides are nearly flat, and the cross section is square. The angles are strongly indented and a rib runs longitudinally down the middle of each side. This rib is more projecting on the interior than on the exterior and on exfoliated specimens it may appear as a groove, but in the most perfect examples it appears as a narrow, slightly elevated ridge. The transverse costae are rather coarse, being about 15 in a centimeter. They are however, more closely arranged toward the apex. They are strongly convex outwardly and are evidently made up of 8 more or less independent sections, two to each face. These tend to meet at the four angles and down the four median lines, but are occasionally replaced by sharp striae which form V-shaped depressions one above another. The costae appear to be subangular and the interspaces more or less flat. Many specimens appear to retain their original deep, blue-gray color.

Measurements (in mm.) of 10 Specimens.

	1	2	3	4	5	6	7	8	9	10
Actual Fragmental Length	53	35	51	50	48	38	37	31	52	50
Added length estimated for point	10	20	30	15	12	10	16	10	15	15
Total length	63	55	81	65	60	48	53	41	67	65
Apical angle	25°	26°	24°	23°	24°	28°	26°	27°	22°	24°
Largest diameter	26	21	24	18	23	24	21	18	22	21
Average transverse costae per cm.	15	16	16	16	16	14	14	14	15	15

Occurrence: The specimens were collected from a greenish-brown shale in the Seminole Formation about .2 mile east of the northwest corner of section 3, T. 12N., R.10E., in a field about fifty feet south of the road.

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Engineering Education Similar to General

Basically the objective in engineering education differs in no way from that of education in general, that is, the development of the student's ability to use effectively such grey matter as God has given him. We have no bag of tricks to give a student that will furnish him qualities not within the reach of other men. Certain it is that no vehicle of education can be made more stimulating and effective than science and engineering. But certain it also seems to be that no instruction can be made more inert, less thought-provoking, more effective in developing a factual memory and putting the mind to sleep, than science and engineering as they are far too often taught.

On the other hand, literature and history, economics and politics make no claim to provide more than qualitative answers to the problems they pose. Their teaching can to some degree be mechanized. Facts are essential to even qualitative thinking, but the emphasis is on the many-sided nature of the problems posed. The student becomes aware of the multiplicity of factors involved; he begins to acquire some caution, to make sure that he sees all the sides and angles. He begins to realize that, while it is highly desirable that all problems be clearly thought through many of them can be answered today only on a qualitative basis—only by striking a balance between the pros and the cons. Scientific and engineering education tend too often to breed an intolerance on the part of the student, a complete lack of interest in any problem which cannot be answered in exact mathematical terms. (Professor Hardy Cross of Yale once remarked that almost any absurdity, if put in the form of an algebraic formula and dressed up with an impressive array of Greek symbols, would be accepted without question by any senior engineering class.) Not the least contribution which subjects of general educational value can make in an engineering curriculum lies in the very fact that they cannot employ the exact, fully rationalized techniques so dear to the engineer's heart. — Dean James K. Finch (Columbia University), in *Trends in Engineering Education.*

A PRELIMINARY REPORT ON THE GOLDEYE, *AMPHIODON ALOSOIDES* RAFINESQUE

By Mayo Martin

University of Oklahoma, Norman, Okla.

INTRODUCTION

References for both Amphiodon and Hiodon of the fish family Hiodontidae were consulted in seeking material on the goldeye. The assumption was that the genus Hiodon might reveal valuable information about the life history of *Amphiodon alosoides*. Very little has been written concerning the goldeye.

In addition to the references, the Cooperative Fisheries Experiment Station has collected data and scales from 147 specimens of this species. Ninety stomachs have been collected for a study of the food habits of this fish, in addition.

The goldeye has been increasing in abundance in Lake Texoma. W. H. Thompson says that there has been a perceptible increase in the relative numbers of this fish appearing in gill net hauls each year. This increase has interested persons conducting studies in fish management at the lake.

Goldeye is valuable both as a food fish and for sport fishing. In Canada, smoked goldeye is considered a delicacy. Fishermen have found that it rises readily to the fly and fights gamely, leaping repeatedly after being hooked.

DESCRIPTION

Amphiodon alsoides is a beautiful fish. The back is bluish-green above, and the sides are silvery with a golden tinge. The body is elongate and compressed, with a carnate ventral edge, and is covered with large cycloid scales that have a silvery lustre. The head is naked, short, and blunt. The mouth is moderate in size, oblique, and with almost equal jaws. There are large canine teeth on the tongue, with smaller teeth present on the jaws, vomer, palatines and pterygoids. Nine developed rays on the dorsal fin make it easy to tell this fish from Hiodon. In size, it rarely exceeds twelve inches in length, but Simon reports one from the North Platte River in Wyoming which was sixteen inches in length and weighed two pounds and eleven ounces.

DISTRIBUTION

Hubbs and Lagler (2.) report that Hiodontidae occur only in North America. Rafinesque (1820) first discovered the goldeye in the Ohio River at the falls of the Ohio. Jordan states that the goldeye occurs from the Ohio river to Saskatchewan River and in western rivers. A clue to its western distribution is obtained from Simon (8.), who reports that it occurs in Wyoming and Montana. In Oklahoma, Paden (5.) lists the catching of goldeye in the Washita River, Illinois River and Red River. A strange feature of the goldeye's distribution is that it does not seem to occur in the Great Lakes.

HABITS

Jordan (4.) stated that these fish feed on both terrestrial and aquatic insects, molluscs, and small minnows. According to Sprules (7.), goldeye in Manitoba's marsh regions enter marshes to spawn in early spring. Little is known about the habits of goldeye at the fingerling stage, but Fish

(1.) reports that young *Hiodon tergisus* Le Sueur are found at creek mouths and near shore in Lake Erie.

Sprules (7.) learned a great deal about the habits of this fish by attaching a fine mesh wire screen to the dam and flushing water through the part of the dam where the screen was attached. Goldeye flushed more readily at night than during the day and the greatest movement occurred during the hours of sundown and sunrise.

In Oklahoma, goldeye seem to be active throughout the year. On January 8, 1948, one gill net took sixty-five fish. Strange as it may seem to veteran fishermen, many of the fish were caught in the top part of the net, very near the surface. That same day the author caught one goldeye on a deep running artificial plug.

Usually the goldeye seem to be caught in the net in small groups of four or five fish. This seems to indicate that they are gregarious and travel in small schools; however, the school may be larger than one might think, for the gill net is very selective and possibly many smaller fish swim through the net.

Good methods of fishing for goldeye will enable the fisherman to harvest a better crop. W. C. Harris (from Jordan (4.) relates that they rise freely to the artificial fly in early spring months, but disregarded the fly as warm weather approaches. He further says that grasshoppers are good summertime bait. Jordan indicates that they take the artificial fly well in middle August in Canada. The author caught them in Lake Texoma on an artificial surface fly in August, fly fishing in the evening after sundown.

SUGGESTIONS FOR RESEARCH

A study needs to be made of the parasites in *A. alosoides*. A superficial observation indicates that trematodes may be the same species as the new form Hunter and Bangham (3.) report from *Hiodon tergisus* Le Sueur. Also a problem needs to be done concerning the food habits of this fish. This problem should be done by someone having an interest in entomology.

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Sense of Superiority

What the colleges—teaching humanities by examples which may be special, but which must be typical and pregnant—should at least try to give us is a general sense of what, under various disguises, *superiority* has always signified and may still signify. The feeling for a good human job anywhere, the admiration of the really admirable, the disesteem of what is cheap and trashy and impermanent—this is what we call the critical sense, the sense for ideal values. It is the better part of what men know as wisdom.—William James, in *Memories and Studies.*

EPISODE IN A MUSEUM

By Ralph W. Dexter

Professor of Biology, Kent State University, Kent, Ohio

Six trilobites in the museum case reposed,
Dead for centuries, how many, no one knows.
Since Cambrian time they knew no strife
Until one day, alas! they came to life.
Six little trilobites who lived once more
Set out to see the sights galore,
For many a change had taken place
Since they swam the seas and lived in grace.
They shook the Cambrian dust in haste
And scampered about the museum case
On all their forty legs and more
To see the wonders unknown before.
At first they came to a slab of stone,
Back to the Silurian it was known,
And in this rock they found Eurypterus
Killed by ancient seas impetuous.
Next, the lobe-finned fish Crossopterygian;
A foot print called Thinopus from Devonian.
Eryops and other Stegocephalians
All the way down to Lissamphibians.
Reptile bones and tracts were next in view
Showing all the diverse forms and new.
Reconstructions of the grandest reptiles;
Pictures, too, of flying Pterodactyls.
A reptile with feathers on its body and hands,
Back in the Jurassic fell in the sands,
And now the six trilobites with eyes afix
Behold the great fossil Archeopteryx.
On and on they went through nature's evolution
Viewing here in minutes time, age-long transformation.
Such a sight they waited long to see
Centuries and centuries before it came to be.
At last, animals covered all over with hair—
Duck bills, marsupials, and all were there.
Said one trilobite to another in amaze,
"What next shall we see in this wondrous gaze?"
Frogs and toads, snakes, lizards, and crocodiles,
Birds and mammals, too, and bones in piles.
Never before had six trilobites known
Such a glorious array of flesh and bone.
At last one looked outside the case,
Beyond the glass it saw a funny face.
So strange and odd and so forlorn,
"To our kingdom, could it belong?"
So anxious to tell was the three-toed sloth
That from his perch he screached an oath
To warn the six little trilobites
To hurry away as fast as mites.
For there stands he who put us here,
Stuffed us and chiseled us without a tear.
Named and classified, and put us on a list,
This omnipotent mammal, this zoologist!

CONSERVATION IN ONTARIO

The following news items are presented through the courtesy of the Department of Lands and Forests of the Province of Ontario, which is headed by the Hon. H. R. Scott and F. A. Mac Dougall, Minister and Deputy Minister respectively of the Department.

BIRD DEATHS AT NIAGARA FALLS

TORONTO, 23 Dec. 1948. The romance and fascination of Niagara Falls are well known, what is not so well known is that there is more of tragedy than romance in the spectacle which for generations has fascinated visitors from all over the world.

Conservation Officer R. A. Muma of the Department of Lands and Forests, in whose territory the falls are located, has for many years been retrieving from the waters below the falls the remains of many species of ducks and other waterfowl which for various reasons have been carried over the cataract. The following species were picked up and forwarded to the Department during the period November 19/1948 to January 20/1949.

6	Common Loons
1	Red-throated Loon
1	Pied-billed Grebe
16	Horned Grebes
1	Double-crested Cormorant
1	Mallard Duck
2	Black Ducks
2	Greater Scaups
1	Baldpate
1	Canvas-back
10	Golden-eye Ducks
1	Buffle-head
1	Ruddy Duck
20	Old Squaw Ducks
9	Red-breasted Mergansers
4	American Mergansers
16	White-winged Scoters
5	American Scoters
1	Surf Scoter
1	Coot
1	King Eider
43	Herring Gulls

22 species — total 144.

One of the species noted is a King Eider adult female duck. Very few of these ducks have been reported from the Great Lakes during the past decade. Another surprising thing is the number of herring gulls which are listed. Most of those recovered were in fairly good physical condition.

Investigation has shown that a large proportion of the waterfowl which are picked up were sick or injured before being swept over the falls. Many are greasy or oil soaked, others are in an emaciated condition, while not a few have been wounded by hunters. Casualties are heaviest during the period of migration.

AERIAL TREE SEEDING

SOULT STE. MARIE, Ont., 23 Dec. 1948. The large aerial tree seeding experiment has been completed by the Ontario Department of Lands and Forests over the Mississagi fire area. During the seeding approximately 50 million coated seeds were strewn over a 50-thousand acre block. Species used were white, red and jack pine and white spruce. A small quantity of scotch pine was used as a "tracer."

Surveys of the fire area had shown that there were many large unburned patches in which seed trees remained. These trees will be relied upon to provide the re-seeding where present, but in areas where no seed trees remained the research officers in charge of the work made every effort to place the seeds where they would do the most good. This is admittedly an experiment but with a good chance of worthwhile success as shown by tests made previously. The first check of the results will be made next autumn. Final results will not be known for two or three years.

Flying was done with a Stinson Reliant aircraft, and was carried on from the main Air Service Base at Sault Ste. Marie, Ontario, because, while the inland lakes were frozen, the St. Mary's River was still free of ice. The pontoon-equipped machine encountered no difficulty in landing and taking off.

Before being distributed from the aircraft, the seeds have been "pelletted" with a special coating to give them a better change of survival.

FRYING PAN BISCUITS

ALGONQUIN PARK, ONT., 18 Feb.: Many a cook could learn something on these cold winter nights by just sitting around the bunkhouse of the Lands and Forests Department staff at Cache Lake, because now is the time the boys get together — or very, very far apart — on their recipes.

Take the question of biscuits — tea biscuits. Most housewives buy a prepared mixture, wet it down with milk or water, place it in the oven and five minutes later place the biscuits on the table.

"But what are you going to do if you haven't got an oven handy?" ask the rangers.

And out of the lengthy and heated discussion which followed came the following recipe for frying pan biscuits:

The rangers use one cup of flour, two teaspoons baking powder, two tablespoons of shortening, one fourth teaspoon of salt, four heaping tablespoons of dried milk and one third cup of water.

"Sieve all the dry ingredients together three times. If cold lard or butter is to be used, rub it in lightly. Add water and stir until the dough is reasonably smooth. Drop from a teaspoon into a frying pan that has been liberally greased with salt pork or bacon fat. Cover and cook over a medium fire until brown on the bottom. Turn and brown the other side.

THE OVERRATED WOLF

TORONTO, 18 Feb.: Little known facts about the life and habits of the wolf are coming to light in the face of a province-wide dispute as to the value —or otherwise—of lumps. Officials of the Department of Lands and Forests are receiving much information from trappers, prospectors and hunters, and are carefully examining it in an effort to find out whether it is advisable on the one extreme to make an all-out effort to eliminate the wolf; on the other extreme not to molest it at all, leaving nature to maintain her natural balance, or to adopt an in-between course, such as in fact is being followed now, of thinning out wolf populations where they may become too abundant for the welfare of the remaining animals.

It is generally understood the wolf does have some uses — despite reports to the contrary. Although admittedly a killer, he, perhaps unintentionally, provides food for other animals. Observations carried on in Algonquin Park have shown that, on at least one occasion, a deer killed by a wolf had served as a food source for every known fur bearer in the Park. Even the birds shared in the meal which had been provided. One official reported finding a fisher, a very scarce animal, living inside another deer carcass. The fisher had found a nice warm winter home, with food right at his nose, and had evidently lived inside the frozen carcass for some weeks.

The means generally used to kill wolves in Northern Ontario are poison, snares and shooting. Poison is frowned upon by many who argue that it is liable to be picked up by other fur bearers and dogs. Even the snare is sometimes the cause of death for other animals.

Dan McDonald, Sault St. Marie, who lived in the district of Algoma before wolves were first found there in 1906, insists, in correspondence with the Department, that the animal is a coward; that there is no authentic record of any human being attacked by a wolf, but that the animal is also an extremely smart one.

Mr. McDonald declared he had hunted for sixty of his seventy years, and says many "scarce" stories originated in a picture "in our old Third Reader" of wolves chasing a team and sleigh loaded with a man and his family, the "man holding a child as though to give it to the animals to save the rest of the family." The scene depicted was in Russia and "no such stories should be published in our school books," he contended. He is one of the few men, he said, who has actually seen wolves mating. He agrees with many hunters that the wolf kills more than he requires, but says wolves will return to a deer kill.

Clarence Marshall, operator of a model trapline in the Parry Sound area, declared: "The one thing that has protected the wolf most is the big build-up he has been given. He has been publicized until one would think he is a ghost." Zoning of trap lines, a step taken recently by the Department, "will change the wolf picture," he insisted.

DESTRUCTIVE BEARS

FRENCH RIVER, Ont., 4 March: George St. Denis, veteran Indian trapper from the French River, has declared a vendetta against the black bear. Bruin owes Mr. St. Denis "two canoes and a cargo of roofing paper," he told a meeting of officials of the game and fish division, Dept. of Lands and Forests, with a group or trappers representing all parts of Ontario. The bear, he said, is the most destructive animal in the bush. He kills beaver, deer, moose. In the spring Bruin will eat any type of small animal he can catch — and he can catch them all. Mr. St. Denis cited cases of bears entering trappers' cabins through the door and "out through the window or the side of the shack." He comes in through the roof, ripping off the shingles or roofing paper. He takes a poke at a canoe and that's the end of the canoe. One of them got mixed up with several rolls of the roofing paper I had laboriously packed in to one of my cabins, and tore the rolls apart. Then to add insult to injury, the bear — obviously a mother — had torn pieces off the rolls and given them to her cubs to play with. The youngsters tore the larger pieces into scraps which were absolutely of no use to anyone.

"I don't," muttered Mr. St. Denis unhappily, "like bear."

CANADIAN DUCK CENSUS

ONTARIO, 19 March: Each winter the Dominion Wildlife Service, with the help of the various Provincial Fish and Wildlife Services, along with other interested parties, carry out a duck census in order to ascertain the numbers and the species of duck that winter in the Dominion waters.

This year the official dates of the census were from January 11 to 14 inclusive; however, in the Toronto region, the census was taken on January 9 so that full coverage of the Toronto and neighbouring districts could be taken by members of the Toronto Ornithological Club.

The Fish and Wildlife Division, Department of Lands and Forests, had personnel to direct the coverage of 15 of the 18 pertinent census areas in Ontario. Of the 65,232 ducks recorded in this census, 55,588 were reported by the personnel of the Department.

The census was carried out by three methods: (1) by personnel on foot, (2) by personnel from automobiles and (3) by personnel in an aeroplane. The majority of the observers were equipped with binoculars and in some cases with telescopes. Each duck is recorded, and, if possible, identified as to species. The former two methods of census-taking are fairly accurate but the third gives a better picture. By the use of an aeroplane the observer is able to fly over the rafts of duck and obtain a good estimate of each raft.

Twenty-three species of waterfowl were tabulated and these included: Whistling Swan (7): Canada Goose (500): Snow Goose (40): Mallard (3976): Black Duck (7080): Baldpate (1): Pintail (11): Wood Duck (3): Redhead (29): Ring-necked Duck (1): Canvas-back (18,454): Greater Scaup Duck (20,813): Lesser Scaup Duck (26): Common Golden-eye (6,409): Buffle-head (709): Old-squaw (2158): King Eider (3): White-winged Scoter (7): Ruddy Duck (2): Hooded Merganser (2): Common Merganser (2328): Red-breasted Merganser (54):

and American Coot (4): The compiled total also includes 1,120 Mergansers which were unidentified as to species, and 1,495 ducks were also unidentified.

The largest concentration of ducks was recorded in the Detroit River and the South Shore of Lake St. Clair. The total amounted to 24,877 and included in one instance 14,600 canvas-backs.

Many may be surprised when noting some of the above species observed. It is not unusual to see what some people consider "summer" ducks as these occur practically every winter, providing there is adequate food, protection and unfrozen waters. Nevertheless observers are very interested to see at any time during these months such species as: Whistling Swan: Canada Goose: Snow Goose: Baldpate: Pintail: Wood Duck: Ring-necked Duck: Lesser Scaup Duck; Ruddy Duck: Hooded Merganser and American Coot. One can expect to see King Eider (rarely) and Red-breasted Merganser (occasionally), with the other "winter ducks," but the average list would normally include: Greater Scaup Duck: Common Golden-eye: Bufflehead: Old-squaw and Common Merganser which winter each year on the Great Lakes.

The census is organized by the U. S. Fish and Wildlife Service who desire a count of all the ducks on the continent to compare each year's totals with the different species for their present status. Many U. S. hunters often are under the impression that Canadian waters may be a "trap" for ducks during the winter months so that even if we had no ducks the census should cover our open waters. The low numbers noted may dispel such a belief.

UNAPPRECIATED ALEWIVES

PORT CREDIT, Ont., 1 April: Early season commercial fishermen from this port have reported to the Lands and Forests Department an unusually heavy run of shad, alewives, or "saw-bellies" in their nets and biologists and research workers are now trying to find a commercial use for the little fish, which average about seven inches in length and resemble a small herring or smelt.

The fish, so far as is known here, were first introduced by New York State fisheries officials, and probably came from the Hudson River in the form of eggs. The State officials, it is believed, thought they were introducing shad into Lake Ontario and somehow the eggs got mixed up. In any event, herring fishermen on the Canadian side of the lake now are having plenty of trouble with the alewife, which piles up in their gill nets and requires hours of labour to remove them and clear the nets.

Unfortunately, the fishermen say, there is no commercial use for the alewife, although persons who have taken the trouble to clean and cook them claim they are quite tasty. They are excellent for fertilizer or fishmeal, but it costs too much to net them and transport them for these uses. At least one of the commercial fishing companies has been carrying on research in an effort to find a market for the alewife and for the lamprey eel and ling, with Government biologists co-operating. It is pointed out that many people of European descent eat and enjoy various types of fish which are classed in Canada as "coarse" varieties and recently it was suggested that perhaps Canadians were being too "fussy" about their table fish.

The lowly sucker, oft cursed by Ontario anglers and camp operators, was once a staple article of diet among the Indians and the forefathers of those who today believe all such coarse fish should be removed from Ontario waters. Even the carp, known as the "pig-fish" for his habit of rooting around the weeds in shallow water, is a valuable delicacy to many central Europeans, both overseas and on this continent.

SPRUCE BUDWORMS AND D.D.T.

TORONTO, 16 April: Expected to be of world-wide scientific interest, a voluminous report on the experiments carried out by the Ontario Department of Lands and Forests on use of dichloro-diphenyl-trichlorethane, or "DDT," in the fight against the spruce budworm will be published shortly. Lands and Forests Minister Harold R. Scott declared the report is now in galley proof form, and would be available to the party of international scientists who carried on the experiments and to others interested.

Contributing to the success of the experiment were: Professor C. E. Atwood, Prof. J. G. Breckenridge, Prof. A. F. Coventry, Prof. J. R. Dymond, Prof. R. R. Langford, Prof. T. R. Loudon, Dr. James Savage, R. E. Mackie, all from the University of Toronto: N. R. Brown, H. G. Crawford, Dr. J. J. De Gryse, K. E. Stewart, Department of Agriculture, Ottawa: C. L. Hope, E. B. Shelley Logier, Royal Ontario Museum: M. L. Prebble, Forest Insect Laboratory, Sault Ste. Marie: Peter Addison, Dr. W. J. K. Harkness, Dr. J. M. Speirs, Ontario Department of Lands and Forests: From the United States—Dr. Clarence Cottam, Division of Wildlife Research, Washington, Dr. F. C. Craighead and Dr. R. H. Nagel, Forest Insect Investigation, Beltsville, Md.: Dr. S. Charles Kendeigh, University of Illinois.

Groups and organizations participating were the air and ground crew of aircraft operated by the Department of Lands and Forests and the Department of Chemical Engineering, Dept. of Zoology and Faculty of Forestry, University of Toronto: Fish and Wildlife Service, Department of the Interior, U.S.A.: Leavens Brothers Air Service, Toronto: Meteorological Service of Canada: National Research Council, Ottawa: Ontario Research Foundation, Toronto: Royal Canadian Air Force, especially Squadron 170: Royal Ontario Museum of Zoology, Toronto and United States Bureau of Entomology and Plant Quarantine.

The September BIOLOGIST will carry a sheaf of Australian biological oddities from the "Aboriginalities" section of the Sydney "Bulletin."

Viewing Veterans after Two Years

People often stop, even on the street, and ask about the veterans in the colleges and universities; how are they getting on, and what kind of men are they? The people are curious because the doubters predicted failure on a large scale when the GI Bill of Rights was first proclaimed. Said the doubters:

"The boys will dawdle. It will be a pleasant way of living on the public for a while, but it won't be education.

"What the veterans will demand is training for a job, and fast. You professors will have to get on to yourselves and streamline your four and five years of theory and culture.

"The boys will be hard to handle. They have been shot at for two or three years, and they'll be nervous and jumpy. You will need as many psychiatrists as teachers.

"No, sir, it won't work out. You can't take fighting men out of the South Pacific jungles or off the decks of plunging destroyers, and coop them up in stuffy classrooms. They will quit in a week."

But there is another reason besides casual curiosity why people inquire about the veterans: 1,122,738 veteran students registered for the first semester of the current school year in the colleges and universities of the United States. Most of them probably have been attending since February, 1946. Among them, doubtless, are the great majority of the talented and capable young men of their generation. It is these million and more who will take over the business of running the country in another decade or two, and the citizens naturally are concerned about them. . . .

Modesty and dignity are possibly the most pronounced traits of the veterans. Soldiers returning from the wars have not historically been distinguished by modesty: "Who won the war? *We* won the war!" But this time the veterans are different. Not all of them are refined and polished by any means, but practically without exception their demeanor and outlook are mature, occasionally all but noble; and there is something about each one of them that compels respect. . . .

All in all, the veterans are a splendid lot. They have been proved, they are in deadly earnest, and their sense of responsibility compares favorably with that of college men five or ten years after graduation. It has become fashionable for writers and speakers to be pessimistic about the future. They ought to cultivate the acquaintance of a half-dozen veteran students.—Dean Clement J. Freund, University of Detroit, in *America*.

EDITORIALS

The editorial section of any periodical is that part of the publication where the lad who puts it together gets a chance to sound off without the impediments of cross-references, footnotes or bibliography. Sometimes the editorial page is designedly stimulating. Sometimes it becomes a pulpit,—which, alas, is too often "a coward's castle." Sometimes even Homer nods, and you get something like this:

WHEN YOUR HOBBY RIDES YOU

The Editor of this quarterly knows what the meaning of the old Dutch phrase "to be hexed" implies. A little less than a year ago he started to play around with tropical fish. Now the tropical fish are playing with him.

It all started innocently enough. Ye Editor was teaching a second semester course in bioecology. During the summer the course was to be repeated for the benefit of those public school teachers who are still trying to make up enough credits to get a bachelor's degree,—the same being very necessary for advancement in our state public school system.

In order to put over the elements of ecological relations, a pair of old aquaria were refurbished and set up in the laboratory. An afternoon's seining in a not-too-far-distant tributary of Green Bay netted a number of interesting wild fish, mostly herring, and a few *Chrosomus erytheogaster*, red-bellied dace, some of them quite gaudy in their prenuptial finery.

However, one can't keep even small northern game fish indoors as the Wisconsin weather warms up,—not in a balanced aquarium, at any rate.

So it was that a little scouting around in ichthyological literature pointed to the viviparous exotic types as being perhaps the most unusual as well as the most interesting inhabitants for aquaria,—their chief merit being the fact they require the least attention.

Right there is where your Editor was destined to prove what a sucker he was. "Least attention," indeed!

So an order was carefully prepared, and dispatched to a place somewhere in Ohio, that rejoices in the euphonious name of "Loveland."

Every tropical fish fancier around this neck of the Wisconsin woods had been raising the omnipresent Guppy (and pronouncing it—"goopie")! So, just to be different,—and original—we decided on mollies, platys and swordtails.

Meanwhile the aquaria were cleaned up, shined up and sterilized. We might have accomplished that last with a concentrated solution of methylene blue,—but we tried boiling water, hot out of the superheated tap. No, the glass didn't crack, but what that hot water did to the aquarium cement was sad to contemplate. It oozed out in the most unexpected places.

So we had to send one aquarium to the local pet shop to have it reconditioned. The other one was more rationally treated, and soon presented quite a realistic aquatic habitat, which with healthy (if spindling) plants of eel or tape grass, myriophyllum, elodea and cabomba,—as the women's page always says, — "tastefully arranged," in a washed and sterilized sand and gravel substrate.

Shortly thereafter the ordered articles began to arrive: an air pump run by an induction motor, thermostatically controlled tank heaters, yards upon yards of synthetic rubber tubing, stone air breakers, dip nets, dip tubes,—we were getting slightly dippy by this time, as you may suspect.

Finally a midget milk can arrived in a huge carton. In its dark and cavernous recesses were the fish, *Molliensia sphenops* in black and gold,—*Molliensia latipinna* in midnight black, *Platypoeiclius maculatus* in yellow with large black "moons" on their tails, *Platypociclius variatus* in iridescent greens, and *Xiphophorus hellerii* in vivid reds. Once they were released in the aquaria, (mollies in one, platies and swordtails in the other), the game was on. With slight variations in its course, the game is still on,—and thus far *poecilidae* are winning.

As this year wore on, other types of live bearers have been added to our collection. The number of aquaria has grown from two to six, and some interesting experiences in crossing different types have whetted the interest not only of your Editor, but of practically every advanced biclogy student in the college.

It hasn't all been plain sailing. Our luck with three successive purchases of different male swordtails has registered at minus zero. At least two have been found in a decidedly dessicated condition on the biology library floor,—victims of their propensity for long-range jumping. With the acquisition of plate glass lids to all of our tanks these jumping stunts seem to have been restrained,—the males who broke their necks or brained themselves against their plate glass roof have died in their tanks, instead of on the floor. We have also learned by painful losses that you can't keep two or three male swords in the same tank. It's an all or nothing reaction. Either you have to have perfect shoals of them or none at all. As one prominent author on exotic fishes rather reservedly puts it. "Males are apt to bully one another," Apt, my eye, —they drive one another to ichthyological suicide.

That, however, is no peculiarly male prerogative among the *helleri*. The females are apt to be shrewish, too. In small fish communities, there appears to be almost as well defined social classes and much the same "pecking rights" as the animal behaviorists have discovered in the henyard. All of which goes to show that females are pretty much alike, wherever you find them. Or is it only in the fish and bird phyla this happens? They are not too far apart on the evolutionary scale.

Aside from occasional worried moments when an aquarium went bad from overheating due to a nearby radiator, or from the unannounced demise of two very ordinary river clams, there have been few real problems with our *poecilildae.*

For scavengers—an unpleasant word for perfectly respectable and hardworking members of the aquatic community, —we use the armored catfish, and snails. Clams are *out!* So are tadpoles, newts, and crayfish. They aren't worth their salt, are more bother than they are worth, and make the most ungodly messes when they kick the bucket.

Of the snails, we have had a lot of success with common ordinary pond snails belonging to some thus far unidentified species of *Physa*, the Red Ramshorn *(Planorbis corneus)* and another variety of ramshorn which we found in Shawano Lake and which has proved most happily reproductive in the comparatively warm temperatures of our tanks. These are set at approximately 72 degrees Fahrenheit.

When we started out with our first shipment of tropicals we ordered two pairs of *Corydoras paleatus*, the common dappled Brazilian armored catfish. As we got around a bit, and the number of our aquaria increased, we discovered the attractions of other members of the cat family. Now we have one large tank with its housekeeping supervised by three smooth armored cats, *Callichthys callichthys*. Another tank has been enlivened by the porpoise-like behavior of four iridescent little pink-bellied *Corydoras aeneus*. Still another tank is soberly policed by two *Corydoras julii*, which, incidentally always attract attention by their leopard-like markings. Our latest (and only fifty per cent successful) venture has been to introduce the spiny armored cats to our fish collection. These survivors of prehistoric fish (without much readaptation) rejoice in the impressive scientific names of *Plecostomus plecostomus* Linnaeus. Anything as homely as they are ought to have something in the way of compensation. Their interesting habit of "hunching" up the glass sides of the aquarium with their dime-sized prehensite lips while they remove superfluous algae, makes them valuable as well as striking members of the aquarium family. Unfortunately they *are* a bit on the expensive side. None of our catfish have become amorously aggressive as yet.

Speaking of amourous aggressiveness, our youthful bobby-soxed members of genus *Homo*, species *sap*, haven't seen anything until they have seen a male of the *poecilidae* unlimber his lateral line and do some plain and fancy shimmying around the undercrossed circle of his fancy,—of the moment.

And does he mean business; Well, we don't hang around all night to satisfy our prurient curiosity. But we are clerically suspicious. There are no storks in our biology library, where the great north window sills afford resting place for the aquaria.

There may be no storks, but brother, you should see the babies!

And that brings up an interesting question. Just what does one call the young *viviparous* fish? The dictionary ducks its head and looks foolish. "Fry" comes from Middle English "fri" meaning "seed," which came from old French, "Froi," meaning "spawning," which came from the old Norse "frae" or "frjo" also meaning "seed." (About this time the pale blue cover of our Websters Collegiate was diffused with a delicate pink! But we are persistent, when we want to be!) And then follows: "1. The young of fishes. 2. Very small adults, esp. in schools." About this time we close the ruddy wordbook. We think we're a college. If these fish aren't in school then who is, —or isn't. Back of it all, however, are those semantic,—or better, etymological congenerics, "Fri, froi," and "frjo." There they stand, immutable as the rock of Gibralter,—like Harold at Hastings, or Roland at Roncesvalles, or hammer handed Thor. You can't get around them. They color the meaning of words, and to us "fry" somehow or other always connote piddling little finners just hatched out of eggs,—in other words,—the poorest of poor fish.

With the live-bearers it's different. When these youngsters arrive on the aquatic scene they arrive! Sometimes in quantity, sometimes in rather haphazard fashion and you have to search the bottom debris, and squat down to get a better look up into the roots of the Lemma (duckweed) and the Salvinia (got you that time!) to see if that fat momma fish you've had your eye on has been mislaying a few new aquatic citizens during the night.

Of one thing you may be sure,—if your pump is bubbling in enough air, if your temperature regulator holds the water close enough around the magic 72 degrees, and if your military police have been keeping the place cleaned up and the water clear, and finally if you've fed enough live food, you may be sure that sooner or later you're going to be in the "fri-froi-frjo" selling business,—unless you're cold hearted or Soviet enough (it's the same thing) to enjoy a sadistic spree of liquidation.

Some of the young are quite small, easy to overlook on a gravelly bottom. Some of the paler species with black eyes look like some of those transparent sub-photic species the Beebe expedition people used to fish up from the marine depths off Bermuda,—all eyes and nothing much else.

We have been fairly lucky in keeping our new arrivals. This is probably due to the fact that our older fish get plenty of raw meat, in addition to their usual ration of dried powdered shrimp. Incidentally we never use the old fashioned white flakes made of rice flour and egg white so often sold on gold-fish counters. Occasionally we give our fish a pinch or two of whole rolled oats, ground up fairly fine in a laboratory mortar.

One other saving part of our provisions for new arrivals are our large jungles of "water sprite," an aquatic plant which rejoices in the mouth-filling technical name of *Ceratopteris thalictroides*. It is a violent grower, small plants developing into veritable banyan-tree formations in a short time in a north window. Wise little fish find refuge in its jungle-like recesses whenever one of the old folks in the neighborhood gets a speculative ogreish look in his or her eye.

Once you fall victim to the wiles of exotic fish you will discover that you are in a continuous round of interesting not to say intriguing problems for which the average zoology courses afford few answers and almost no preparation. We use four-horned snails of the Ampullaria type, not as scavengers but in separate gallon jars as producers of infusoria. Two of the *paludosa* species to the gallon, fed on lettuce leaves, will produce enough partially digested waste to keep you in a perpetual supply of the most active *Paramecia* and other infusoria you could imagine. Why hasn't someone written this up for the biological periodicals? The infusoria are grand feed for baby fish.

Superfoetation is another interesting but sometimes annoying feature with the *viviparae*. One insemination of a live bearing female will produce not one, but several litters of young. It slows down your breeding experiments because you practically are forced to put your females "in solitary stir" until they have stopped becoming gravid, i.e., pregnant, before you can breed them to a new male, and don't think you can leave them in tanks with their own offspring. Young males become fertile in six or eight weeks under proper conditions and nature naturally takes its course.

As William T. Innis, author of the standard manual of tropical fish, "Exotic Aquarium Fishes," and the dean of American tank ichthyologists, has remarked, the whole problem of superfoetation is "an interesting subject for research." To which ye Editor would explosively add: "And How!"

If you're serious about this whole business, — and don't think you can monkey with it without its becoming something more than a dilletante interest, — you will want to possess Innis' book and maybe to subscribe to his interesting magazine, "The Aquarium." Out of both you will glean reams of information, strictly zoological, ecological and genetic, yet even more strictly utilitarian.

As a means for interesting your undergraduate students in zoology we knew of nothing better than a few goodsized aquaria of *Poecilidae*. There is something about these ever-restless, flashing bits of living jewelry that outdoes an animal house, a greenhouse or a whole museum full of stuffed or pickled relics. After all, biology is the science of living things. For too long we have been bringing up generations of our biology students on what the late William Morton Wheeler of Harvard at an AAAS in a paper (well worth re-reading) presented at a meeting in 1920, somewhat facetiously but none the less acidly described as "The Dry Rot of Academic Biology." It's time we gave them a lot more of the living to see and study in the science of life.

▽

Cultural Heritage

One of the unique courses in the core curriculum under the Bates Plan is that known as Cultural Heritage. This course, which meets three hours each week during the student's junior and senior years, seeks to enable him to weave together the threads of the philosophy, literature, science, politics, economics, the arts, and other areas that have produced our Western European civilization.

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We hope that, by learning something of the relevance of past developments to present problems, Bates graduates will become more capable of making the best possible decisions concerning the "great issues" of today—that, in short, they will become better citizens.
—*Bates College Bulletin.*

NEW BOOKS

This section offers brief uncritical reports on the general content of recent publications in biological and related fields. Only the longer critical reviews will be signed. For quick location on library shelves, each notice will be preceded, wherever possible, by three groups of numbers, the first two of which will be the Dewey and the Library of Congress classified numbers respectively. The third group is the L.C. card number, for the convenience of Librarians.

THE AMERICAN SPIRIT IN EUROPE by HALVDAN KOHT, University of Pennsylvania Press, Philadelphia, Pa., $3.75.

Russians who believe all the Soviet publicity with which they are being flooded as to their national supremacy in original invention, scientific research, philosophical theory and art, will have small time for this new, refreshing and encouraging tribute to the United States from the pen of one of the former professors of History in Oslo University. The scope of the work is rather too wide for any one feature of our American contributions to world welfare to be exhaustively treated. For us, the subject matter, it gives a novel opportunity in the words of the Scotch poet, Burns, "to see oursels as ithers see us."

BIOCHEMICAL PREPARATIONS, Edited by HERBERT E. CARTER and others, John Wiley and Sons, Inc., New York, N. Y., $2.50.

The first volume, in a series presenting techniques of preparing compounds not usually available on the market, gives a five-sided approach to each. The principles are first stated, then the starting materials are outlined, the procedure is next described in detail, the properties and purity of product are then explained, and the methods of preparation are last outlined. Sixteen compounds are thus presented. Among them are adenosine diphosphate and triphosphate, casein, L-glutamine, Lycopene, Lysozyme and D-tyrosine.

BIRDS OF ARCTIC ALASKA, by ALFRED M. BAILEY, Colorado Museum of Natural History, Denver, Colorado.

This beautifully printed and plenteously illustrated 318-page work is the chronicle of many months of active biological exploration between June 1921 and August 1922. The book's theme is birds but there is enough of botany, travel and experience to entertain as well as inform the most curious.

COLLEGE ZOOLOGY, by GEO. W. HUNTER and J. R. HUNTER, W. B. Saunders Co., Philadelphia, Pa., $5.50.

Here is an entirely new text by the sons of a very well-known teacher of biology. Their book is a sexpartite affair. The first section is devoted to the ecological foundations of zoology, the second to the organization of living systems, the third to invertebrates, the fourth to chordates, the fifth to genetics, embryology and evolution, and the last to conservation, parasitism and disease. There are a number of teaching aids which look very practical. Not the least of these is a topical list of available sound or silent films and sources from which they may be procured.

COMPARATIVE ANATOMY, by L. A. ADAMS and SAMUEL EDDY, John Wiley and Sons, Inc., New York, N. Y., $5.00.

The first hundred pages of this almost entirely new book, based on the senior author's "Introduction" are devoted to a review of the vertebrates. The rest of the 520-page work is taken up with the comparative anatomy of the various systems of organs. There are 364 illustrations or diagrams. There are four pages of apparently adequate bibliography. The 27-page glossary is exceptionally well done, the definitions being short and pithy.

DRUG PLANTS OF AFRICA, by THOMAS S. GITHENS, M.D., University of Pennsylvania Press, 3436 Walnut St., Philadelphia 4, Pa., $2.25.

This slim paper-covered volume, No. 8 in the "African Handbooks" Series, is divided into three main parts, of which the first is a brief sketch on the chemical basis for the use of drug plants, the second is devoted to their use. The third and main portion of the 125-page brochure presents some fifteen sets of tables dealing with plant drugs exported from Africa, the chemical reactions of drugs, drugs of profitable value, drugs used as poisons, plants with other commercial uses, and separate tables of drug plants containing resins, oils, alkaloids, bitter principles, glucosides, saponins, and tannins.

EXPLORING BIOLOGY WORKBOOK, by ELLA THEA SMITH, Harcourt, Brace & Co., New York, N. Y., $1.20.

This High School laboratory manual to accompany the author's test, favorably reviewed in the last "Biologist," is much more exacting and inclusive than many of the college texts on this subject in use today. With the manual there have also been made available a set of test questions which should be of assistance to high school biology teachers. In both there are sufficient exercises for a semester, all of which are perforated for quick removal, and punched for filing in a three-ring binder subsequent to their use.

FARM MANAGEMENT, by JOHN D. BLACK, MARION CLAWSON, CHARLES R. SAYRE and WALTER W. WILCOX, the Macmillan Company, 60 Fifth Avenue, New York, N. Y. $5.75.

This hefty 1073-page textbook is the product of the joint labors of a Harvard professor of economics, a regional administrator, U.S.D. of I., an agricultural economist from the USDA and a professor of ag-economics at the U. of Wis. Each chapter has a short bibliography and a list of test questions at the end.

FIELDBOOK OF NATURAL HISTORY, by E. LAURENCE PALMER, McGraw-Hill Book Co., New York, N. Y., $5.00.

This 664-page volume, with its 2000 or more illustrations, makes no pretense to be a textbook either in botany or zoology. In fact, it is composed of varying proportions of astronomy, geology, botany and zoology. Some 900 plant forms are illustrated and described. A slightly larger number of animal forms are similarly handled. There are even some fifty odd varieties of various kinds of rocks so illustrated and described. With the wealth of material offered, this book should prove a valuable reference work for beginning biology or ecology students. Its chief value will probably be on the high school reference shelves.

FIELD MANUAL OF PLANT ECOLOGY, by FRANK C. GATES, McGraw-Hill Book Co., New York, N. Y., $3.00.

This slim manual presents for the first time the sixty different field laboratory problems that have been in use by the author and his students for some thirty odd summers at the University of Michigan's Biological station. The exercises are roughly divided into the making of quadrats and transects, habitat factors, pH, plant community concepts, and autecological ideas.

FLORA MALESIANA, Edited by DR. C. G. VAN STEENIS, Noordhoff-Kolff, N. V., — Batavia. American agents: Dr. Frans Verdoorn, Chronica Botanica Co., Box 151, Waltham 54, Mass. Prices on application.

This is an interesting series of productions by Dr. Van Steenis and others who are making a bid to cover the plant taxonomy and, to a certain extent, the ecological features of the Malay archipelago, including the Philippines and New Guinea. The first series now in production is devoted to the spermatophyta and will encompass approximately fifteen volumes. The other series are to run as follows:

Series II Pteudophyta (ferns & fern allies) about 3 vols.

Series III Byophyta (mosses & hepatics) about 3 vols.

Series IV Fungi and Lichens about 3 vols.

Series V Algae about 3 vols.

STUDIES IN FRESHWATER FISHERY BIOLOGY, by KARL F. LAGLER and J. W. EDWARDS, Ann Arbor, Mich., $4.00.

This third and revised edition of a very practical field manual on the propagation of game fish should be extremely interesting to conservationists, farmers and owners of vacation properties. There are a number of practical subjects treated, the preliminary ones being devoted chiefly to a rapid but thorough review of ichthyology. Next follow exercises on ecological problems. The more practical parts deal with pollution studies, fish culture, improvement of lakes and streams, creation of new fishing waters and inland commercial fisheries. The field exercise pages are perforated for removal, and handing in for correction.

GUARDIANS OF THE FOREST, by STACY KLINGERSMITH, Dorrance and Co., Philadelphia, Pa., $3.00.

The development of conservation and tree-minded youngsters through Tree Club activities was the incentive for the writing and publication of this new book. Written in diary form, its thirteen chapters being collections of incidents in the field trips of Boy and Girl Scouts, Camp Fire Girls and the Junior Audubon Society. This is a good book for leaders of such groups, and for grade school or public libraries.

GUIDE TO EASTERN FERNS, by EDGAR T. WHERRY, University of Pennsylvania Press, Philadelphia, Pa., $2.00.

This is the second edition of a valuable field manual which appeared originally in 1942. Each of almost a hundred species from the Hudson to the southern border of Virginia, is discussed under five aspects, — history, diognostic features, habitat, range and remarks on additional ways of distinguishing similar species.

HEALTHFUL LIVING, by HAROLD S. DIEHL, M.D., Whittlesey House (McGraw-Hill Book Co.), New York, N. Y., $4.50.

613 RA776.D62 49-7385

This is the revised third edition of a work which has seen some thirteen previous reprintings. It is the scientific as well as practical successor of the old fashioned "family doctor-book." It is advertised as a practical guide for healthful living for the layman. It seems to fulfill that stated purpose.

HISTORICAL GEOLOGY, by CARL O. DUNBAR, John Wiley & Sons, Inc., New York, N. Y., $5.00.

551.7 QE501.D8 49-8024

Yale University has given modern science a whole series of leading geologists, of whom not the least will be the author of this most attractive volume based on, and an outgrowth of, the "The Textbook of Historical Geology" by Schuchert and Dunbar. The revision has been so thorough that this is almost an entirely new book. The illustrations are of very high order. With all the new finds in paleontological fields, this new book becomes a "must" on the library shelves.

HOW TO KNOW THE IMMATURE INSECTS, by DR. H. J. CHU, Wm. C. Brown Co., Dubuque, Iowa, Spiral bound $2.00, Cloth bound $2.00.

Insects undergo so many and such startling stages between hatching and maturity that it is a wonder that some such field book as this has not appeared long since. The work is small in compass, only 234 pages, but has some 631 very clear illustrations. The author, a former student at the University of Illinois, is zoologist of the National Academy of Peiping, China.

HYBRID POPLAR PLANTING IN THE LAKE STATES, by PAUL O. RUDOLF, Division of Forest Management, Lake States Forest Experiment Station, University Farm, St. Paul, Minn., Free.

An interesting account of various experiments in hybridizing and growing various poplars especially useful for the paper industry in Minnesota, Michigan, Wisconsin and North Dakota. The author concludes that the results have been on the whole disappointing and that further research and experiment is necessary.

INTRODUCTION TO HISTORICAL GEOLOGY, by RAYMOND C. MOORE, McGraw-Hill Book Co., New York, N. Y., $5.00.

550 QE501.M6 49-7782

This is an entirely new book by Professor of Geology at the University of Kansas. It is elaborately illustrated with over 350 photographs and charts, and is written in an attractively clear and extremely readable style. It embodies all the most recent discoveries in the field. It should prove a valuable text-book as well as useful reference work.

INTRODUCTION TO PALEOBOTANY, by CHESTER A. ARNOLD, McGraw-Hill Book Co., Inc., New York, N. Y., $4.50.

This is a much-needed book. For years outside of many scattered papers in professional publications, the only standard reference works available in matters paleobotanical were the monumental works of Seward and Scott. These appeared before 1917 in the first case and before 1923 in the latter. In this utterly new work, the outcome of a course for graduate students and uppergrade undergrads at the University of Michigan, all the scattered bits of fossil discovery and paleobotanical theory have been gathered together in one volume of small compass. The 187 illustrations are mostly all new. It will fill a much needed want on our library reference shelves.

INTROGRESSIVE HYBRIDIZATION, by EDGAR ANDERSON, John Wiley and Sons, Inc., 440 Fourth Ave., New York, N. Y., $3.00.

In a day when "intergration" has become a shibboleth, this new work by a genetecist who has had a more than liberal contact with plant taxonomists, should function as a distinctly integrative influence. This work presents hybridization under natural conditions,—i.e., uncontrolled in the open. Its main objective is the effect of hybridization as measured in natural populations. The whole story is one of such interest that one is almost impelled to ask "Why wasn't this done before?"

LABORATORY PROBLEMS IN PLANT SCIENCE, by G. B. CUMMINS, G. A. GRIES, J. H. LEFFORGE and F. W. STEARNS, Burgess Publishing Co., 426 South Sixth Street, Minneapolis 15, Minn., $2.00.

This spirally bound laboratory manual is designed to fit into a second semester course of botany for students who will not major in the subject, but are continuing after the first semester just to have one science requirement out of the way. The semester work is divided over some taxonomy, some economic botany, some plant anatomy, and a liberal dosage of plant pathology.

THE LAND AND WILDLIFE, by EDWARD H. GRAHAM, Oxford University Press, New York, N. Y.

The pictures used in this work alone are worth the price of the book and tell their story by themselves. The author's previous work "Natural Principles of Land Use" presents one side of the principle of land usage,—for farming, etc. This volume complements the previous one, presenting the effectiveness of restoring natural cover for the increase of wild game.

THE LIFE STORY OF THE FISH, by BRIAN CURTIS, Harcourt Brace & Co., New York, N. Y., $3.75.

597 QL617C85 49-7384

The wild subtitle of this work,—"His Morals and Manners," indicates that this is a completely revised and rewritten edition of the previous edition (minus the subtitle). The book is a well planned study of those phases of ichthyology which are of interest or will answer the hundreds of questions raised by enthusiastic fish lovers.

It contains many little known facts that seldom are brought to the surface in comparative anatomy classes.

MICROBIOLOGY AND MAN, by JORGEN BERKELAND, Appleton-Century-Crafts, Inc., New York, N. Y., $5.00.

This is the second edition of a textbook which first appeared in July 1942, had to be reprinted again in 1944 and 1945 and now comes back in a much revised and enlarged form. The four main sections of the book are,—Fundamentals of Microbiology; Infection and Resistance; Common Infectious Diseases; Microbiology of Air, Food, Milk, Water, Sewage and Soils. Curiously enough there is very little in the book on insect borne diseases,—malaria for instance. Neither malaria nor mosquitoes are mentioned.

OUR LIVING FORESTS, by JOSEPH T. HAZARD, Superior Publishing Co., 2603 Third Ave., Seattle 1, Wash., $4.00.

634.909795 SD144.A13H35 Agr 48-4229

Pacific Northwest forestry is the theme of this somewhat off-the-beaten-trail type of book. It has no bibliography, and it doesn't need one. It is the straight-from-the-shoulder thinking of a man who knows his trees, his forests, his forestry and who can write virile English prose. The book is a mine of information, yet interesting reading.

PHOTOSYNTHESIS IN PLANTS, Edited by JAMES FRANK and WALTER E. LOOMIS, the Iowa State College Press, Ames, Iowa, $7.00.

This monograph consists of seventy-two papers by thirty-four cooperating scientists from various universities, and research centers, under the editorship of a professor of chemistry at the University of Chicago and a professor of plant physiology at Iowa State College. Incorporating as they do, not only many phases of photosynthetic research, but the results of others thinking and doing along photosynthetic lines, these papers are an important contribution to our knowledge. The bibliographies are unusually complete.

POISONOUS DWELLERS OF THE DESERT, by NATT N. DODGE, Southwestern Monuments Association, Box 1728, Santa Fe, New Mexico.

591.69 QL100.D6 49-1584

This attractively printed and well illustrated 44-page pamphlet presents detailed descriptions of all the actually deadly venomous creatures of our southwestern deserts, as well as treatments for those who have been bitten or stung. A valuable part of the work is the inclusion of many non-venomous congeners of deadly forms, and others which because of their ugly appearance, suffer from the superstitious misinformation of the native population.

PRACTICAL PLANT ANATOMY, by ADRIANCE S. FOSTER, D. VanNastrand Company, Inc., New York, N. Y., No price given.

581.4072 QK673.F65 49-7917

The second edition of Dr. Foster's original work which appeared only seven years ago and has had two reprintings since, is completely revised both as to subject matter and laboratory procedures. The subjects treated include the protoplast, cell wall, meristems, the various types of tissues, stems, leaves, and roots. The author frankly admits that including the flower would enlarge the book beyond practicability. After all, the flower is the proper subject for the taxonomist and the geneticist.

PREHISTORIC LIFE, by PERCY E. RAYMOND, Harvard University Press, 44 Francis Ave., Cambridge 38, Mass., $5.00.

560 QE711.R3 48-1065

This 1947 printing is the second in the history of this work, of which "The Biologist" said in 1939: "To cover the main points in a billion and a half years of earth history in slightly more than three hundred pages is a feat of no small proportions, particularily when the cosmic story is so tellingly and accurately told." We see no reasons for changing that opinion.

PRINCIPLES OF VETERINARY SCIENCE, by FREDERICK BROWN HADLEY, W. B. Saunders Co., Philadelphia, Pa., $5.00.

This fourth edition of a work which appeared successively in 1920, 1924 and 1939, has been completely revised in keeping with its main purpose, not as a veterinary college textbook but as a manual for those in related phases of animal industry, or for those who are preparing to enter veterinary schools.

RADIOACTIVE MEASUREMENTS WITH NUCLEAR EMULSIONS, by HERMAN YAGODA, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., $5.00.

The use of photographic emulsions is becoming an important adjunct in the investigation of radioactive radiations by the ionization produced in their traversing matter. Essentially not a new idea (Moser observed the images produced on photographic emulsions by non-metallic substances back in 1842), new applications are here outlined more in keeping with the advance of modern research. "Any scientist who owns a microscope can make quantitative radioactive measurements" with the aid of this book.

TEXTBOOK OF ANATOMY AND PHYSIOLOGY, by DIANA KIMBER, CAROLYN GRAY, CAROLINE STACKPOLE, and LUTIA LEAVELL, The Macmillan Co., 60 Fifth Ave., New York, N. Y., $4.00.

611 QM26.K5 48-10668

This is the twelfth revised edition of a work which dates back to 1893 and has been going strong ever since. It aims to be both a general human physiology and hygiene textbook and to include anatomical and physiological material required by the National League of Nursing Education. Since the authors are all women in the teaching and nursing professions it is to be expected that the treatment would be more full and exact on matters of feminine concern than in a textbook put together by a mere man.

TITANS OF THE SOIL, by EDWARD JEROME DILS, The University of North Carolina Press, Chapel Hill, N. C., $3.50.

Here is a series of dynamic and vivid biographies of,—as the subtitle has it, —"Great Builders of Agriculture." Among those apostrophised are George Washington, Thomas Jefferson, Watson Whitney, Ellsworth, Ruffin, Deere, McCormick, Morrill, Johnson, Atwater, Knapp, Babcock, Smith, Carleton, Wiley and Shull. Other schools of thought and other areas of the nation might have nominated different slates of agricultural immortals to this hall of fame. (We should have liked to see L. R. Jones, Wisconsin's great plant pathologist in the list.) Even the chapter entitled "And These, Too, Sowed" has some omissions that are hard to understand. The book, however, is one that needed doing. It should serve its purpose as a modern hagiography of the field.

TRACE ELEMENTS IN FOOD, by G. W. MONIER-WILLIAMS, John Wiley & Sons, Inc., New York, N. Y., $6.00.

This British work treats of all those elements which play some part in the nutrition of plants, animals or men, even though in the most minute quantities. Some of these are innocuous, some otherwise. This book attempts to give a comprehensive survey of the knowledge a food chemist should have of the biochemistry, nutritional significance, and the toxicology of these elements, how far their presence in foods is to be expected, the commercial ways in which they may be introduced into foods, and how best to determine and demonstrate their presence.

VEGETABLE GROWING, by JAMES E. KNOTT, Lea & Febiger, Philadelphia, Pa., $4.00.

635 SB321.K5 Agr 49-17

This thoroughly revised fourth edition of a standard manual aims to bring commercial horticulture up to date with new techniques developed in the increasing mechanization of gardening by stressing the fundamentals of plant growth. It therefore emphasizes the salient characters of crops, growth affecting factors and cultural considerations.

WORKBOOK IN FUNDAMENTALS OF PLANT SCIENCE, by GEORGE B. CUMMINS and GEORGE A. GRIES, Burgess Publishing Co., 426 South Sixth St., Minneapolis 15, Minn., $2.00.

The authors are understanding their purpose in the title of this work. It does mean WORK and no doubt about it. Every one of the 121 loose-leaf pages represents many stimulating series of questions, diagrams or sketches which should make the average freshman botanist sweat blood. He would undoubtedly learn some botany in the process. So would his instructors and laboratory assistants.

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Mile Posts

1915 March 17, Alpha Chapter organized, Ohio State University, Columbus.
1916 May, Central Governing Body organized, BIOLOGIST first issued.
1917 June, last War-time BIOLOGIST issued.
1921 February, BIOLOGIST revived.
1924 December, First National Meeting, Constitution revised, Washington, D. C.
1925 December, Second National Meeting, First Science Program, Kansas City.
1926 December, Third National Meeting, Second Science Program, Philadelphia.
1927 December, Third Science Program, Nashville.
1928 December, Fourth National Meeting, Coat-of-Arms adopted, Fourth Science Program, New York.
1930 January, Council Meeting, Ritual Revised, Norman, Okla.
December, Fifth National Meeting, Fifth Science Program, Cleveland.
1931 Phi Sigma Letters Registered, U. S. Patent Office.
1932 December, Sixth Science Program, Atlantic City.
1933 June, Sixth National Meeting, Seventh Science Program, Chicago.
1935 December, Seventh National Meeting, Eighth Science Program, St. Louis.
1937 December, Eighth National Meeting, Ninth Science Program, Indianapolis.
1939 December, Ninth National Meeting, Tenth Science Program, Silver Anniversary, Ohio State University, Columbus.
1941 December, Tenth National Meeting, Dallas, Texas.
1946 December, Eleventh National Meeting, Boston, Mass.
1948 December, Twelfth Meeting, Eleventh Science Program, Albuquerque, N. Mex.

The Constitution provides that: "A new active chapter may be established in any four-year degree-granting college or university . . . which is equipped with facilities for research in biological sciences to such an extent that at least one degree beyond the baccalaureate may be earned from that institution for biological research pursued there."